



TAOGLAS®



Datasheet

Warrior X

Part No:
PA.740.A

Description:

Warrior X Wideband Antenna for LTE & FR1 5G NR Bands (698-4900MHz)

Features:

High Efficiency Wideband Antenna
Covering FR1 5G NR Bands for China
Surface Mount Distribution
Dimensions: 40 x 5 x 6mm
Manufactured in an IATF16949 Certified Facility
RoHS & REACH Compliant

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1. Introduction



The Taoglas, Warrior X PA.740.A is a patent pending, high-efficiency, wideband SMD ceramic antenna, designed to cover worldwide LTE bands and FR1 5G NR bands for China (4800~4900MHz). It uses high grade custom ceramic material and new design techniques to deliver the highest efficiencies on all bands when mounted on the device's main PCB. The PA.740 is backward compatible for global 3G/2G applications. The PA.740 is delivered on tape and reel and mounted securely during the device PCB reflow process. The PA.740 also operates with great efficiency on worldwide NB-IoT and CAT-M frequency bands.

Typical applications include:

- Transportation
- Robotics
- Wearables
- Autonomous/UAVs
- Industrial IoT

The PA.740 is more resistant to detuning compared to other antenna integrations. If tuning is required it can be tuned for the device environment using a matching circuit, or other techniques on the main PCB itself. There is no need for new tooling, thereby saving money if customization is required. The Material is highly reliable and robust, the PA.710.A, on which this antenna's design is based, is currently used by world leading automotive manufacturers in extremely challenging environments. The PA.740 has a small profile, 40*6*5mm, allows for ease of integration.

Contact your regional Taoglas customer support team to request these services or additional support to integrate and test this antenna's performance in your device.

2. Specifications

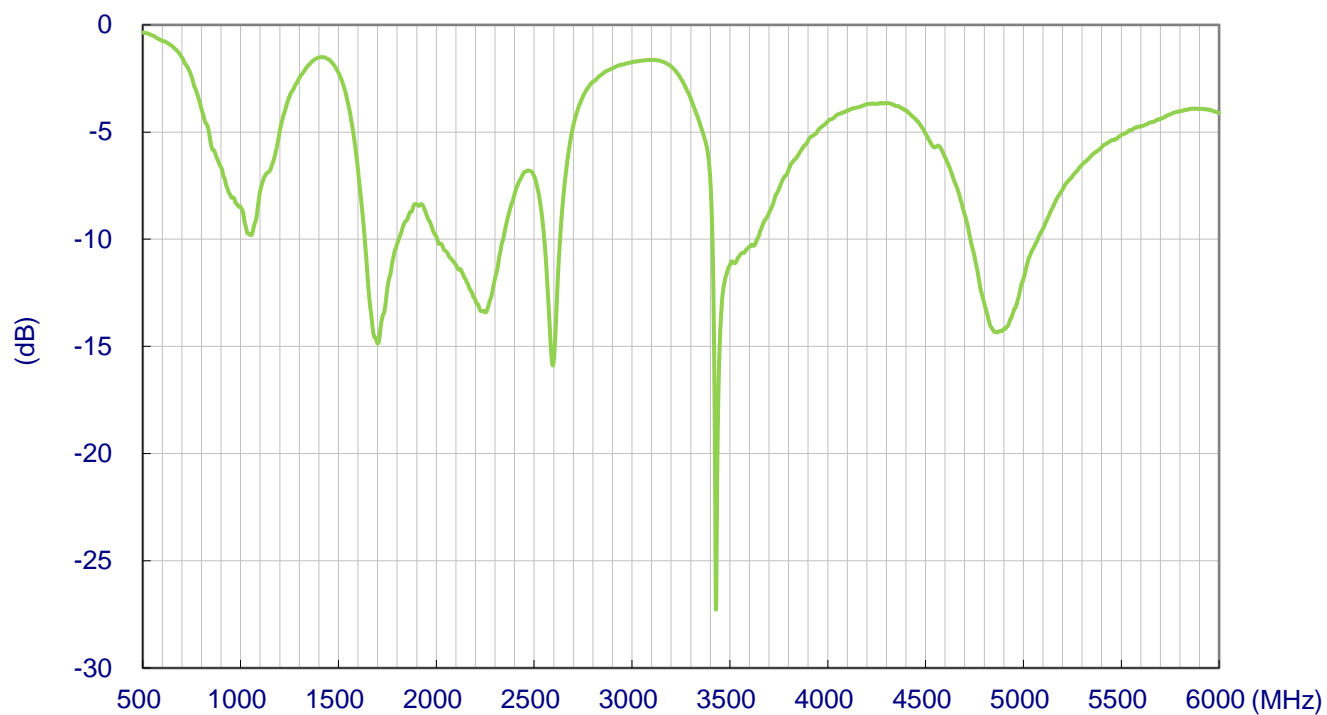
Electrical													
Band	LTE 700	LTE 800	GSM 850	GSM 900	GPS/ GLONASS/ BeiDou	DCS	PCS	UMTS1	LTE 2300	LTE 2600	LTE 3500	CBRS	Band 79 5G
Frequency (MHz)	698 ~806	703 ~803	824 ~894	880 ~960	1561 ~1602	1710 ~1880	1850 ~1990	1920 ~2170	2305 ~2360	2300 ~2690	3400 ~3600	3550 ~3700	4400 ~5000
Efficiency (%)													
On EVB (130mm)	36.38	37.43	60.23	60.08	50.95	75.98	70.13	70.53	58.67	48.97	41.25	55.43	62.43
Average Gain (dB)													
On EVB (130mm)	-4.41	-4.33	-2.04	-2.08	-3.30	-1.04	-1.48	-1.52	-2.32	-3.14	-2.97	-2.56	-2.08
Peak Gain (dBi)													
On EVB (130mm)	-1.48	-1.36	0.73	0.95	1.88	3.79	3.77	4.00	3.40	1.87	1.53	2.08	3.13
Impedance	50Ω												
Polarization	Linear												
Radiation Pattern	Omnidirectional												
Mechanical													
Material	Ceramic												
Dimensions	40*6*5mm												
Termination	Ag (environmental Pb free)												
Weight	3g												
Environmental													
Temperature Range	-40°C to 85°C												
Moisture Sensitivity	Level 3												

LTE/5GNR Bands			
Band Number	5GNR/FR1/LTE / LTE-Advanced / WCDMA / HSPA / HSPA+ / TD-SCDMA		
	Uplink	Downlink	Covered
1	UL: 1920 to 1980	DL: 2110 to 2170	✓
2	UL: 1850 to 1910	DL: 1930 to 1990	✓
3	UL: 1710 to 1785	DL: 1805 to 1880	✓
4	UL: 1710 to 1755	DL: 2110 to 2155	✓
5	UL: 824 to 849	DL: 869 to 894	✓
7	UL: 2500 to 2570	DL: 2620 to 2690	✓
8	UL: 880 to 915	DL: 925 to 960	✓
9	UL: 1749.9 to 1784.9	DL: 1844.9 to 1879.9	✓
11	UL: 1427.9 to 1447.9	DL: 1475.9 to 1495.9	✗
12	UL: 699 to 716	DL: 729 to 746	✓
13	UL: 777 to 787	DL: 746 to 756	✓
14	UL: 788 to 798	DL: 758 to 768	✓
17	UL: 704 to 716	DL: 734 to 746 (LTE only)	✓
18	UL: 815 to 830	DL: 860 to 875 (LTE only)	✓
19	UL: 830 to 845	DL: 875 to 890	✓
20	UL: 832 to 862	DL: 791 to 821	✓
21	UL: 1447.9 to 1462.9	DL: 1495.9 to 1510.9	✓
22	UL: 3410 to 3490	DL: 3510 to 3590	✓
23	UL: 2000 to 2020	DL: 2180 to 2200 (LTE only)	✓
24	UL: 1625.5 to 1660.5	DL: 1525 to 1559 (LTE only)	✓
25	UL: 1850 to 1915	DL: 1930 to 1995	✓
26	UL: 814 to 849	DL: 859 to 894	✓
27	UL: 807 to 824	DL: 852 to 869 (LTE only)	✓
28	UL: 703 to 748	DL: 758 to 803 (LTE only)	✓
29	UL: -	DL: 717 to 728 (LTE only)	✓
30	UL: 2305 to 2315	DL: 2350 to 2360 (LTE only)	✓
31	UL: 452.5 to 457.5	DL: 462.5 to 467.5 (LTE only)	✗
32	UL: -	DL: 1452 to 1496	✗
35		1850 to 1910	✓
38		2570 to 2620	✓
39		1880 to 1920	✓
40		2300 to 2400	✓
41		2496 to 2690	✓
42		3400 to 3600	✓
43		3600 to 3800	✓
48		3550 to 3700	✓
71		617 to 698	✗
74/75/76		1427 to 1518	✗
78		3300 to 3800	✓
79		4400 to 5000	✓

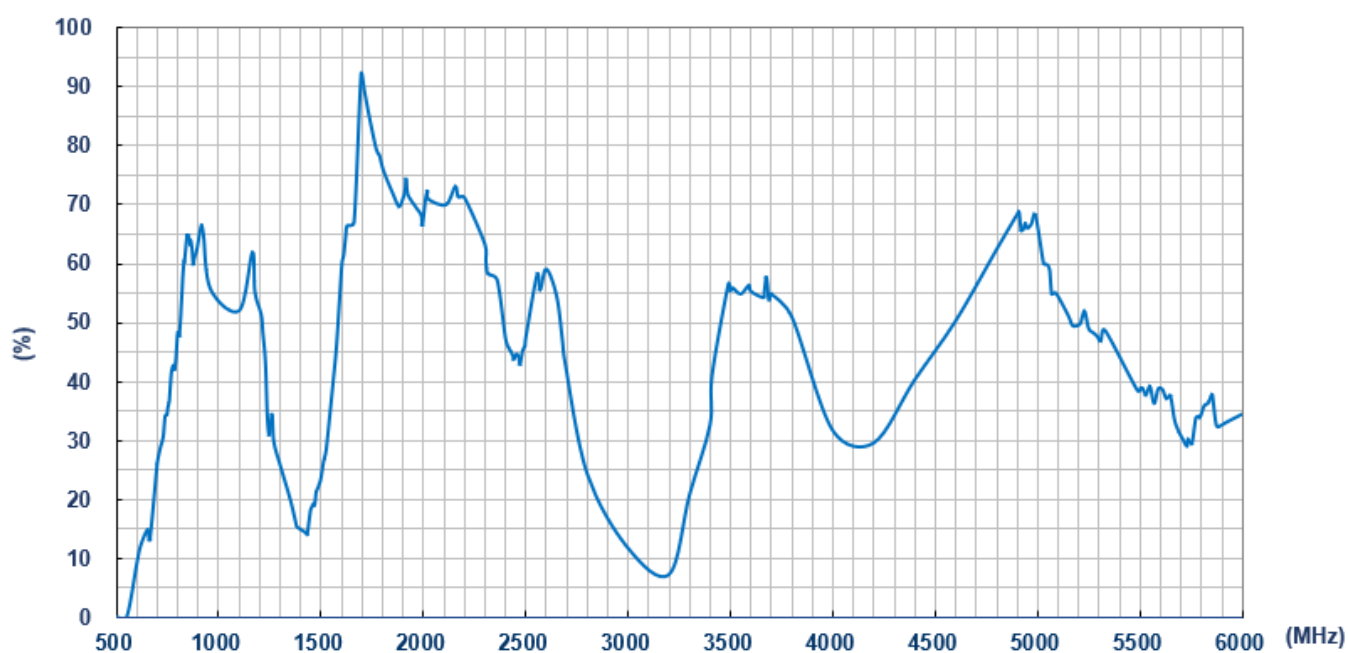
*Bands covered represent efficiency of 20% or higher.

3. Antenna Characteristics

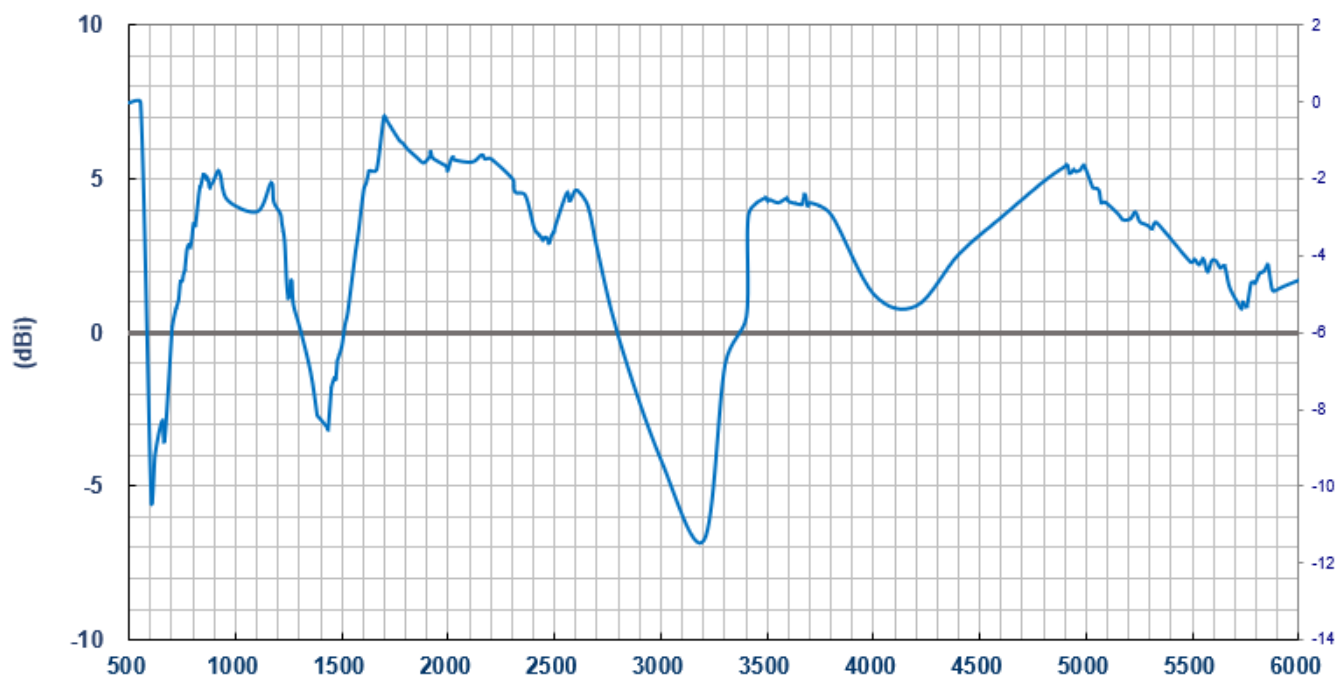
3.1 Return Loss



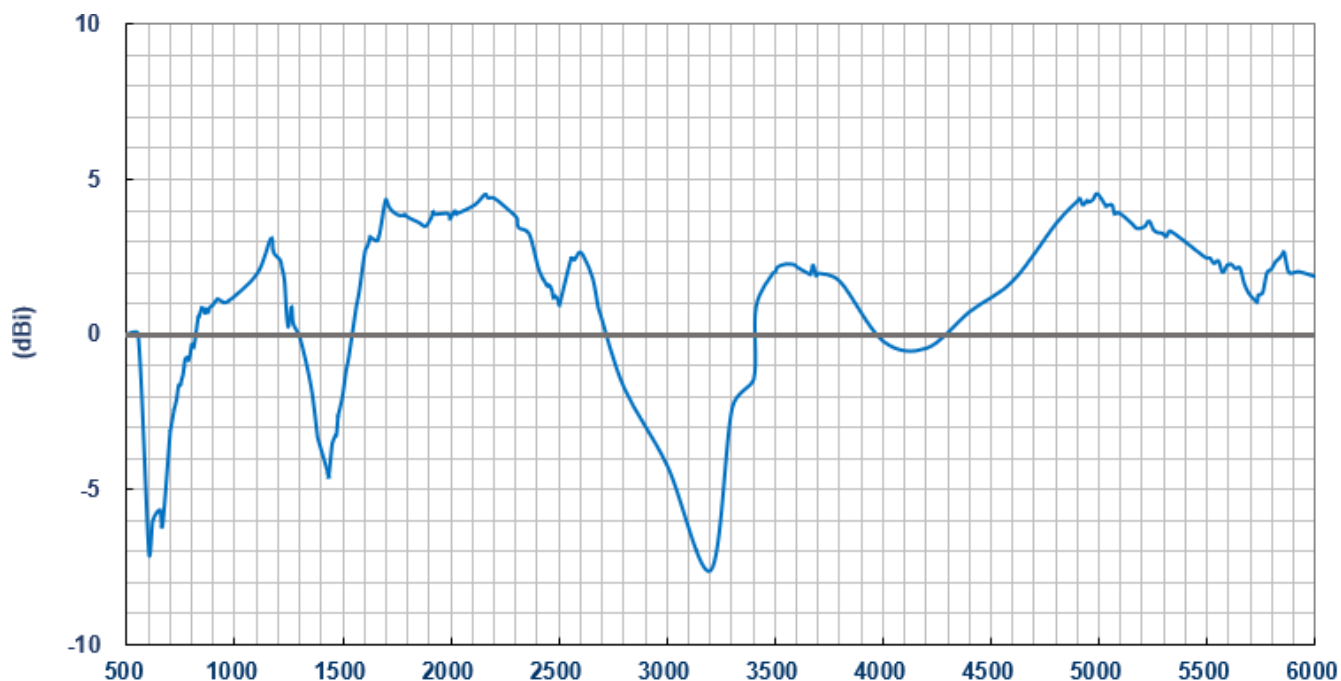
3.2 Efficiency



3.3 Average Gain

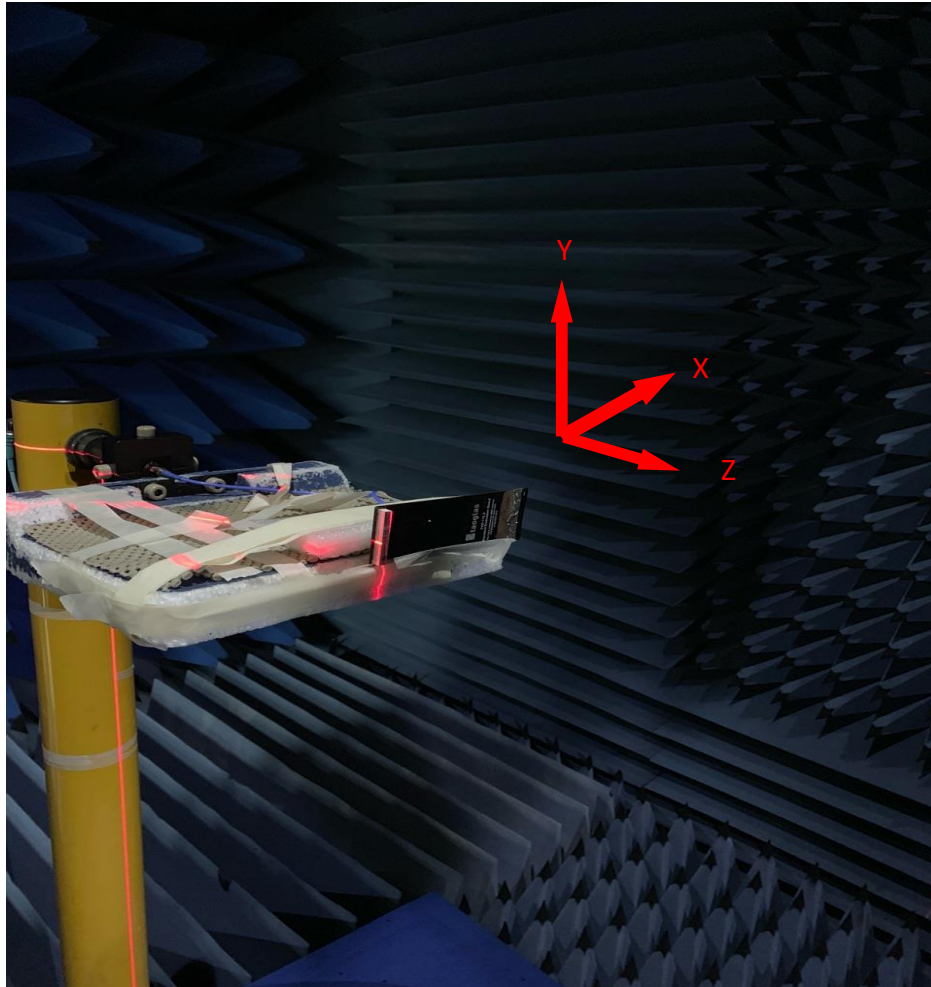


3.4 Peak Gain

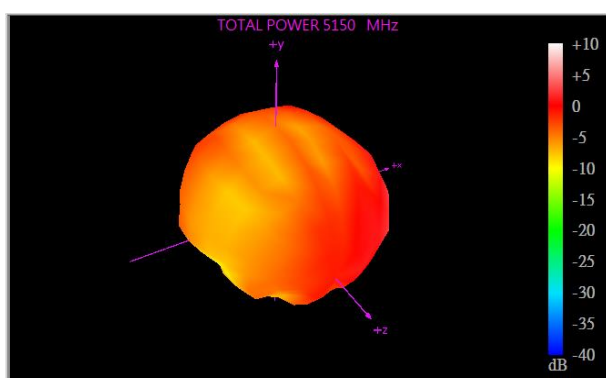
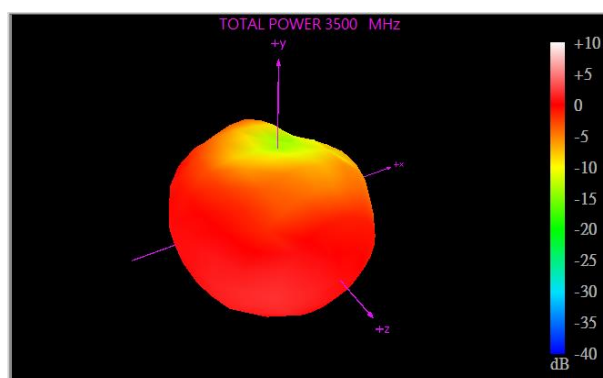
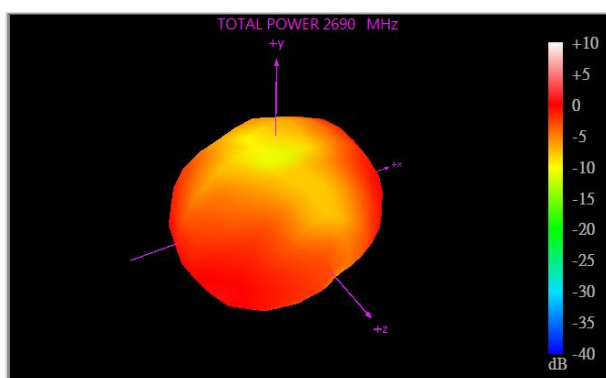
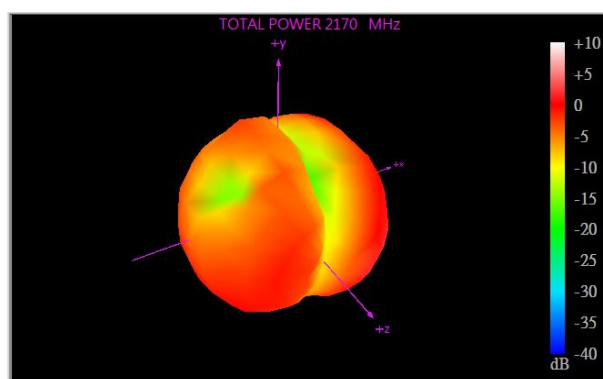
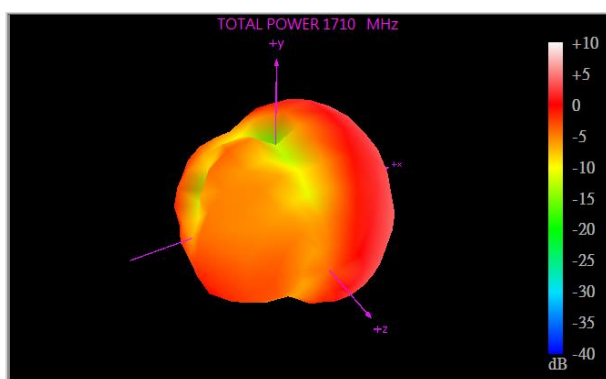
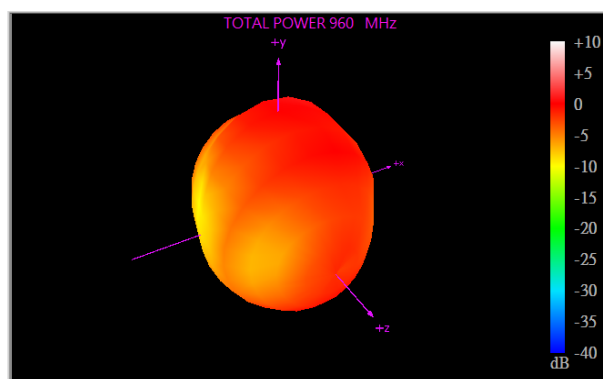
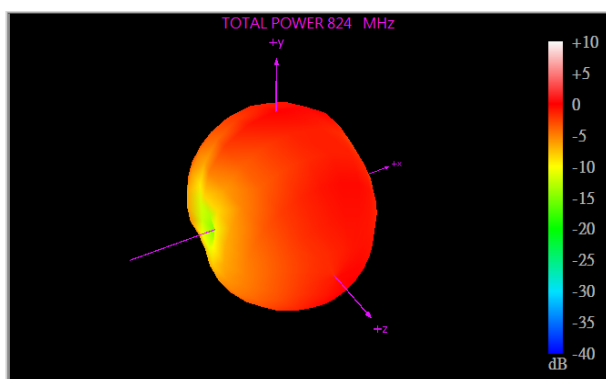


4. Radiation Patterns

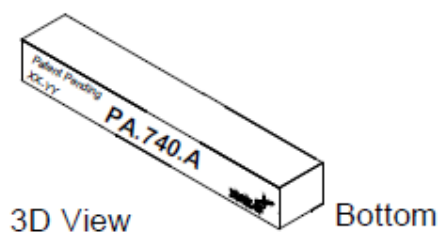
4.1 Test Setup – on Evaluation Board PAD.740.A



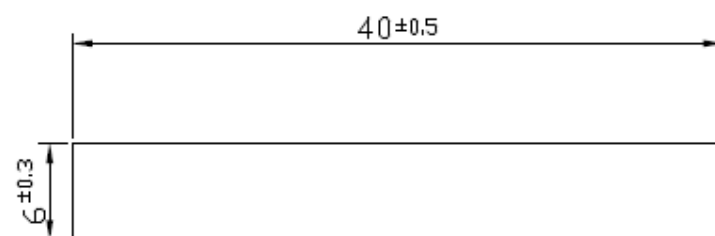
4.2 3D Radiation Patterns



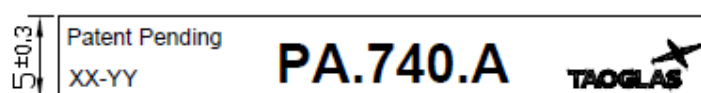
5. Mechanical Drawing - Antenna (Units: mm)



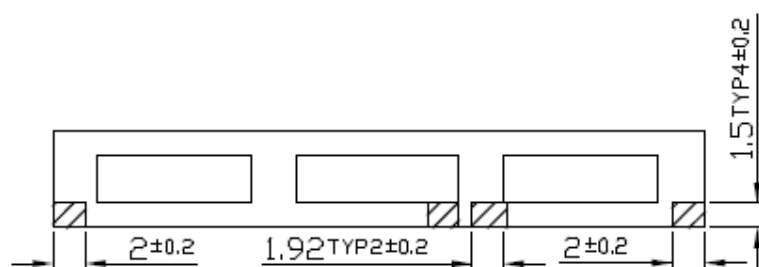
Back

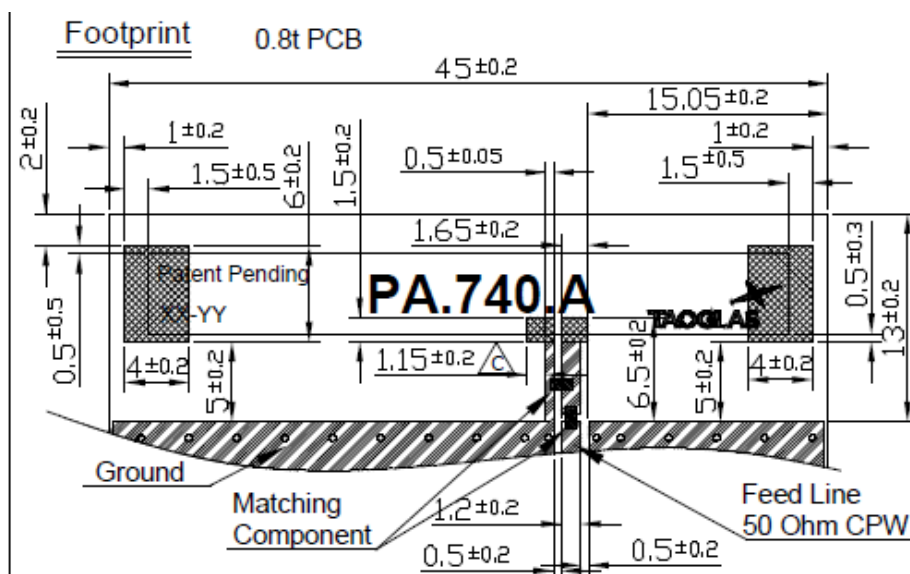


Top

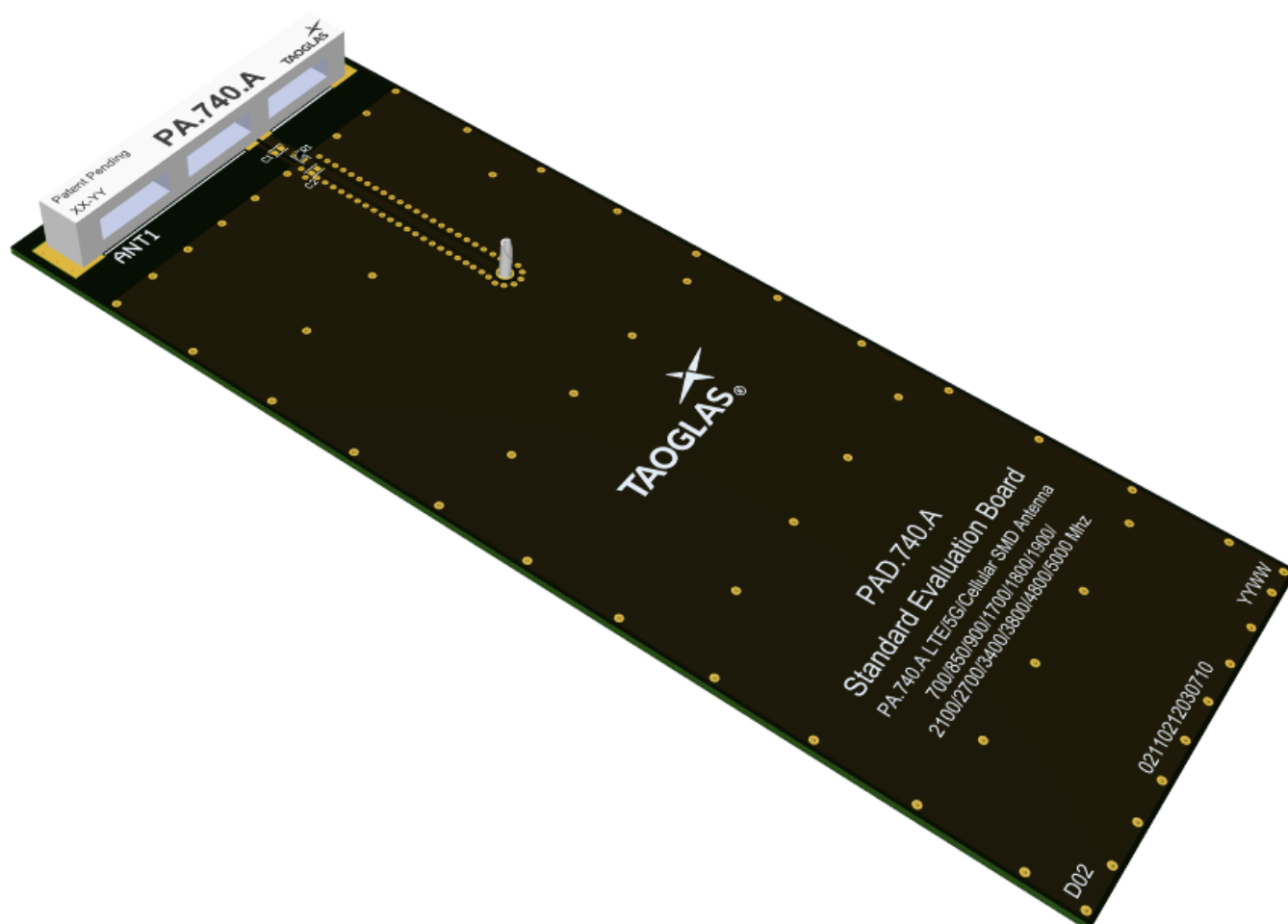


Front





7. Antenna Integration Guide

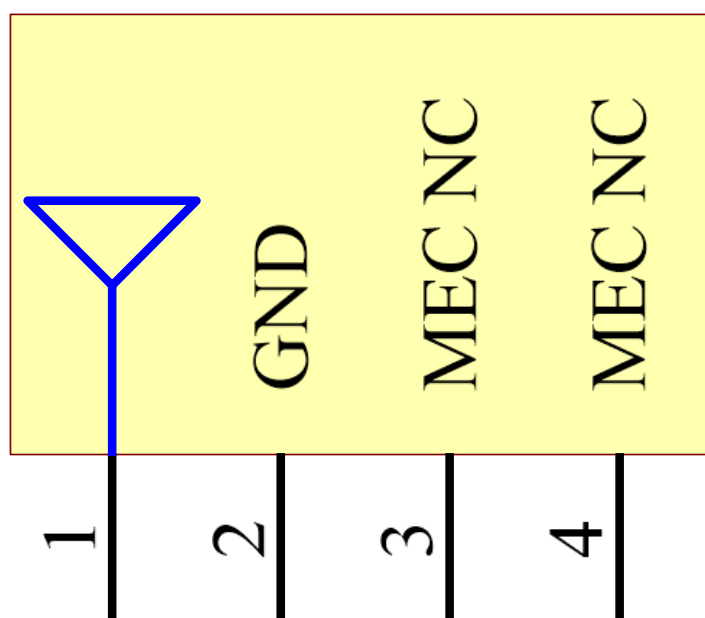


7.1 Schematic Symbol and Pin Definition

The circuit symbol for the antenna is shown below. The antenna has 4 pins with only two pins (Pin 1 and Pin 2) as functional. Pins 3 and 4 are for mechanical strength.

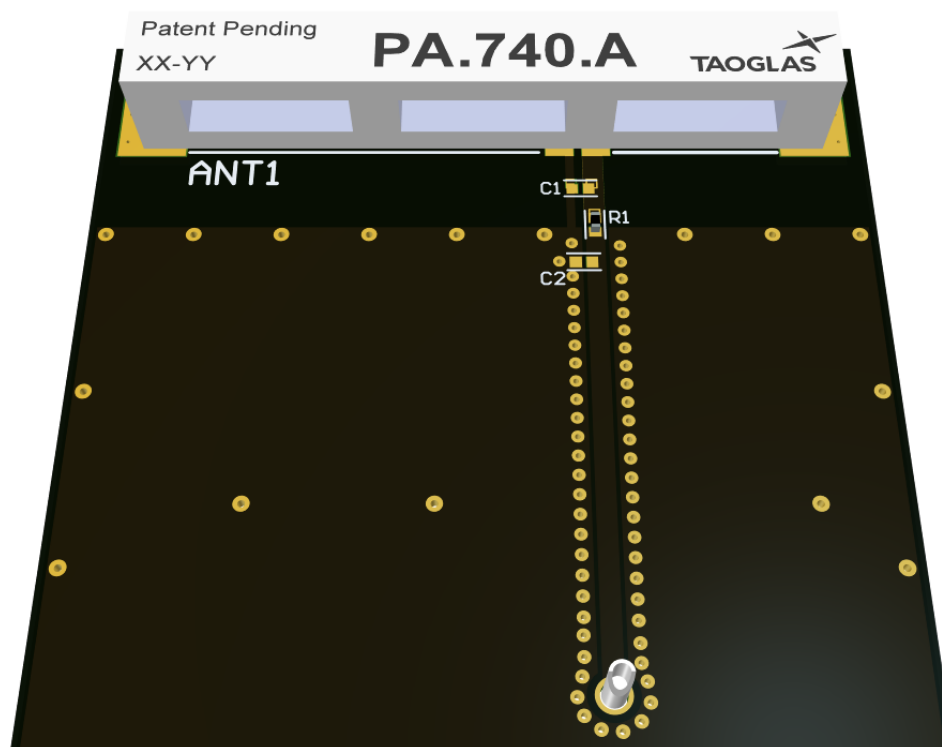
Pin	Description
1	RF Feed
2	Ground
3,4	Mechanical, Not Connected

PA.740.A
ANT1

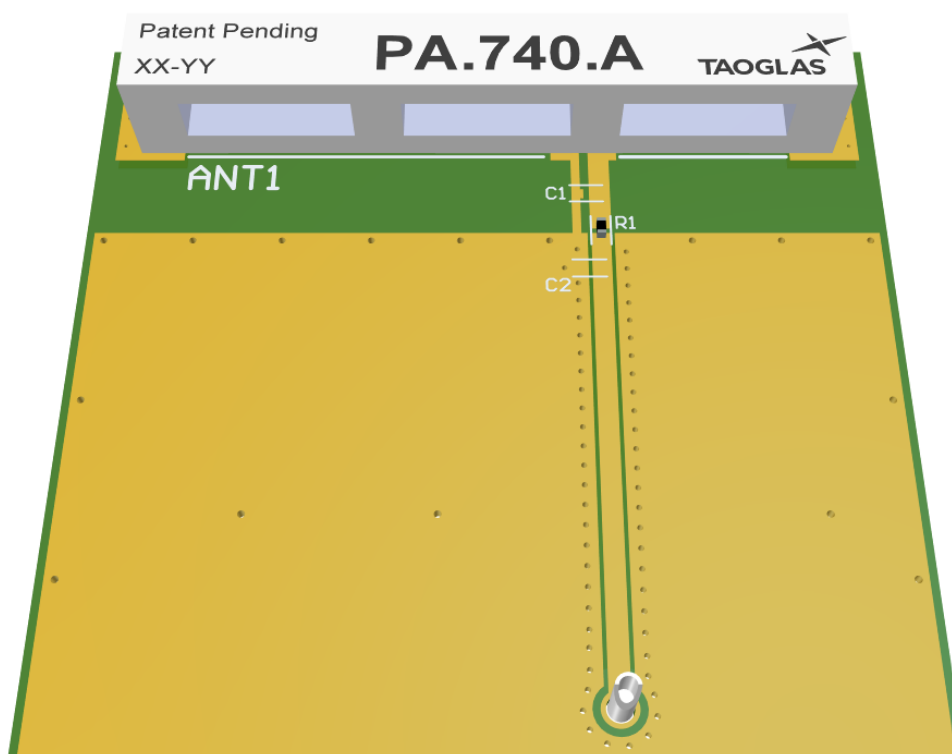


7.2 Antenna Integration

For any given PCB size, the antenna should ideally be placed on the PCB's shortest side, to take advantage of the ground plane. Optimized matching components can be placed as shown.



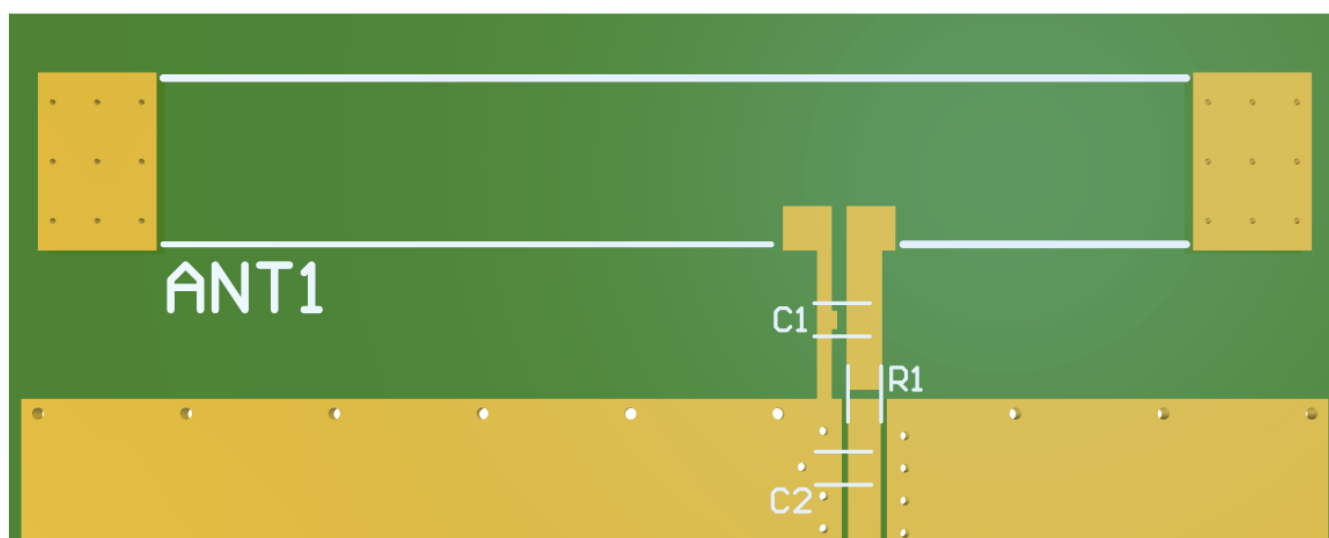
Top Side w/ Solder Mask



Top Side w/o Solder Mask

7.3 PCB Layout

The footprint and clearance on the PCB must meet the layout drawing in (Footprint Drawing). Note the placement of the optimized components. C1 is placed as close as possible to the RF feed (pad 1) but still within the transmission line. R1 is then placed tightly in series after that. C2 is an optional component but the footprint is recommended in case it is needed.



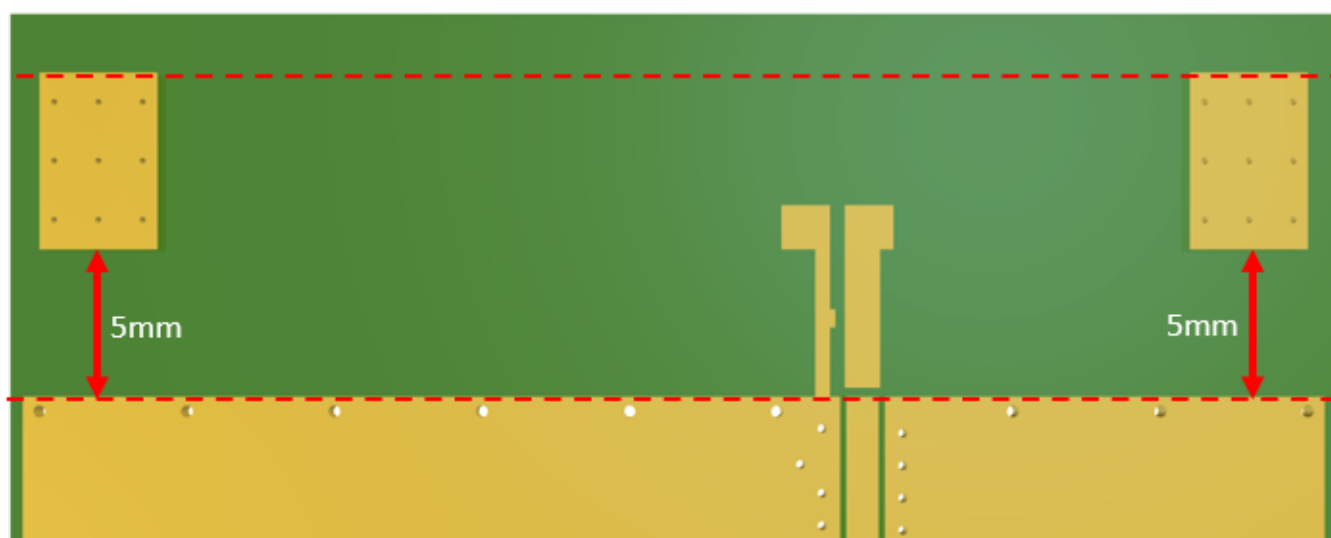
Topside



Bottom Side

7.4 PCB Clearance

Below shows the antenna footprint and clearance through ALL layers on the PCB. Only the antenna pads and connections to feed and GND are present within this clearance area (marked RED). The clearance area extends to 5mm from the antenna mechanical pads to the ground area. This clearance area includes the bottom side and ALL internal layers on the PCB.



Topside



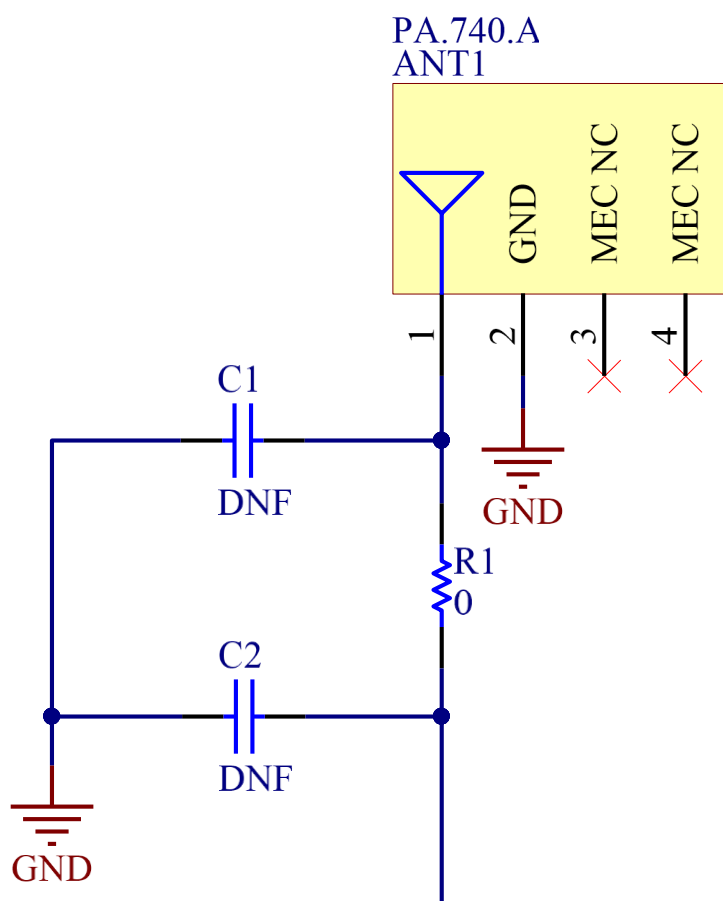
Bottom Side

7.5 Evaluation Board



7.6 Evaluation Board Matching Circuit

Matching components with the PA.740.A are required for the antenna to have optimal performance on the evaluation board, located outside of the ground plane in the space specified in the above images. Additional matching components may be necessary for your device, so we recommend incorporating extra component footprints, forming a “pi” network, between the cellular module and the edge of the ground plane.

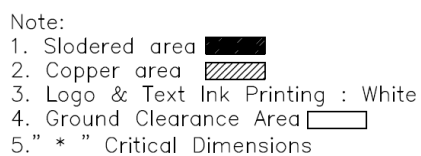


Designator	Type	Value	Manufacturer	Manufacturer Part Number
R1	Resistor	0 Ohms	Yageo	RC0402JR-070RL
C1	Capacitor	Not Fitted	-	-
C2	Capacitor	Not Fitted	-	-

7.7 Vias in Mechanical Pads

Vias are placed in the “no-connect” pads to provide mechanical strength for the pad. These vias are 0.2mm and plated. These vias should be filled with a non-conductive material. Please ensure that the topside surface finish is flat on these pads and the RF Feed and Ground Pad. Vias are covered with soldermask (tented) on the bottom side.



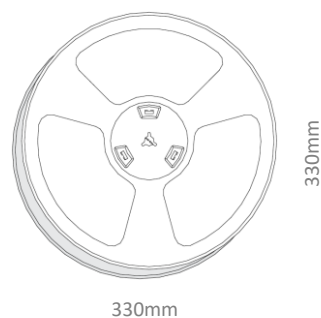


	Name	P/N	Material	Finish	QTY
1	PAD.740.A EVB PCB	02110212030710	FR4 0.8t	Black	1
2	SMA(F) ST PCB	02104220000020	Brass	Au Plated	1
3	PA.740.A Antenna	013A9C5Q00J00D	Ceramic	White	1
4	0 ohm (0402)	021R11000D16J0	Ceramic	N/A	1

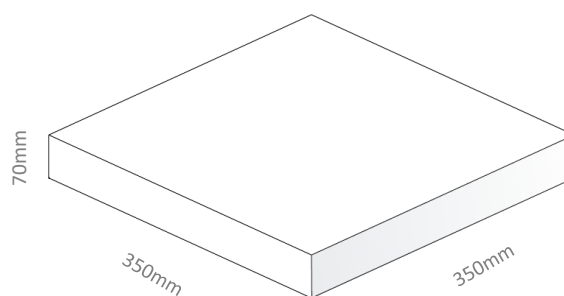
8. Packaging

450 pc PA.740.A per Tape & Reel

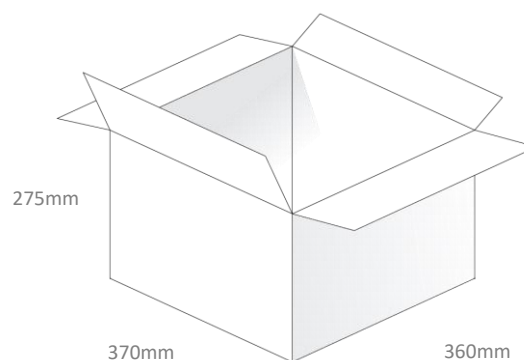
Patent Pending PA.740.A TAOGLAS



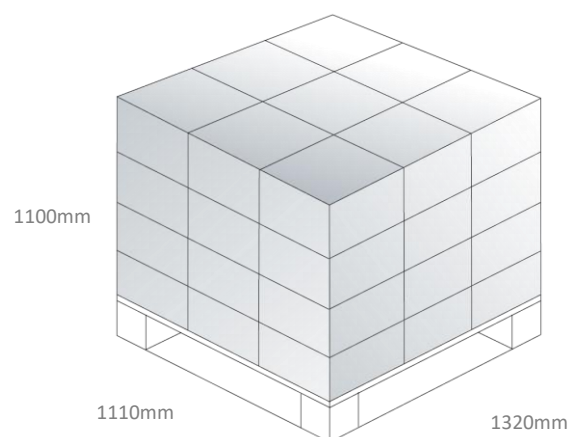
1 reel in small inner box
Dimensions: 350*350*70mm
Weight: 2.4Kg



1350 pcs in one carton
Dimensions: 370*360*275mm
Weight: 8.1Kg

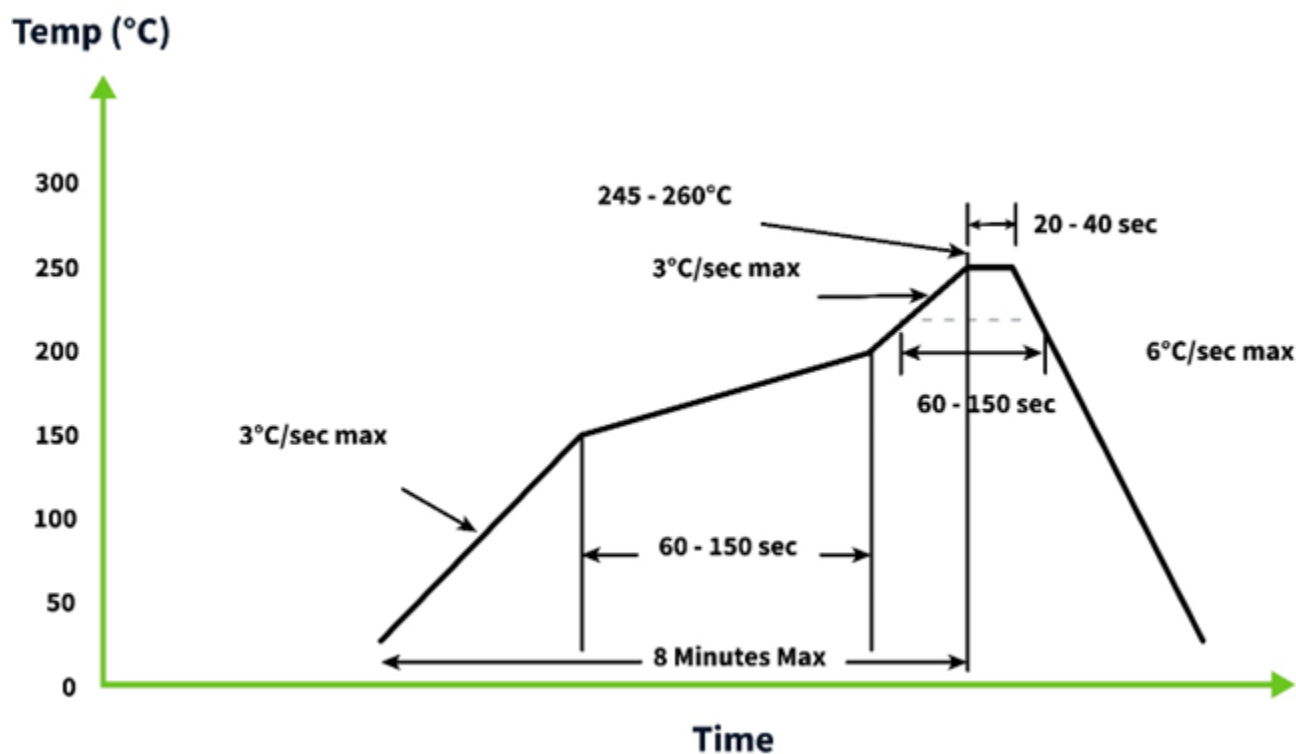


Pallet Dimensions:
1110*1320*1100mm
36 Cartons Per Pallet
9 Cartons Per Layer, 4 Layers



9. Solder Reflow Profile

The PA.740.A can be assembled by following the recommended soldering temperatures are as follows:



*Temperatures listed within a tolerance of +/- 10° C

Smaller components are typically mounted on the first pass, however, we do advise mounting the PA.740.A when placing larger components on the board during subsequent reflows.

Note: Soldering flux classified ROL0 under IPC J-STD-004 is recommended.

Changelog for the datasheet

SPE-19-8-089 -PA.740.A

Revision: D (Current Version)

Date:	2023-10-24
Changes:	Updated the Solder Reflow Profile
Changes Made by:	Cesar Sousa

Previous Revisions

Revision: C

Date:	2023-03-13
Changes:	Antenna Integration Guide Added
Changes Made by:	Cesar Sousa

Revision: B

Date:	2020-11-05
Changes:	Specifications table amended
Changes Made by:	Dan Cantwell

Revision: A (Original First Release)

Date:	2019-06-24
Notes:	
Author:	Jack Conroy



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